



# Operating manual

Digital  
Temperature  
Controller DLTC  
300

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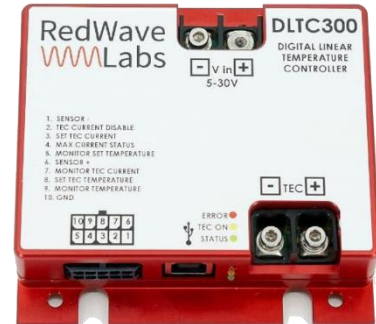
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### Introduction

The DLTC 300 is a Digital Switched-mode Temperature Controller that combines high efficiency with full digital control of PWM (pulse width modulation).

The DLTC 300 has a full digital PID loop with additional optional external correction.

A set of analogue monitors ensures easy system integration. Settings are non-volatile: set up and forget.



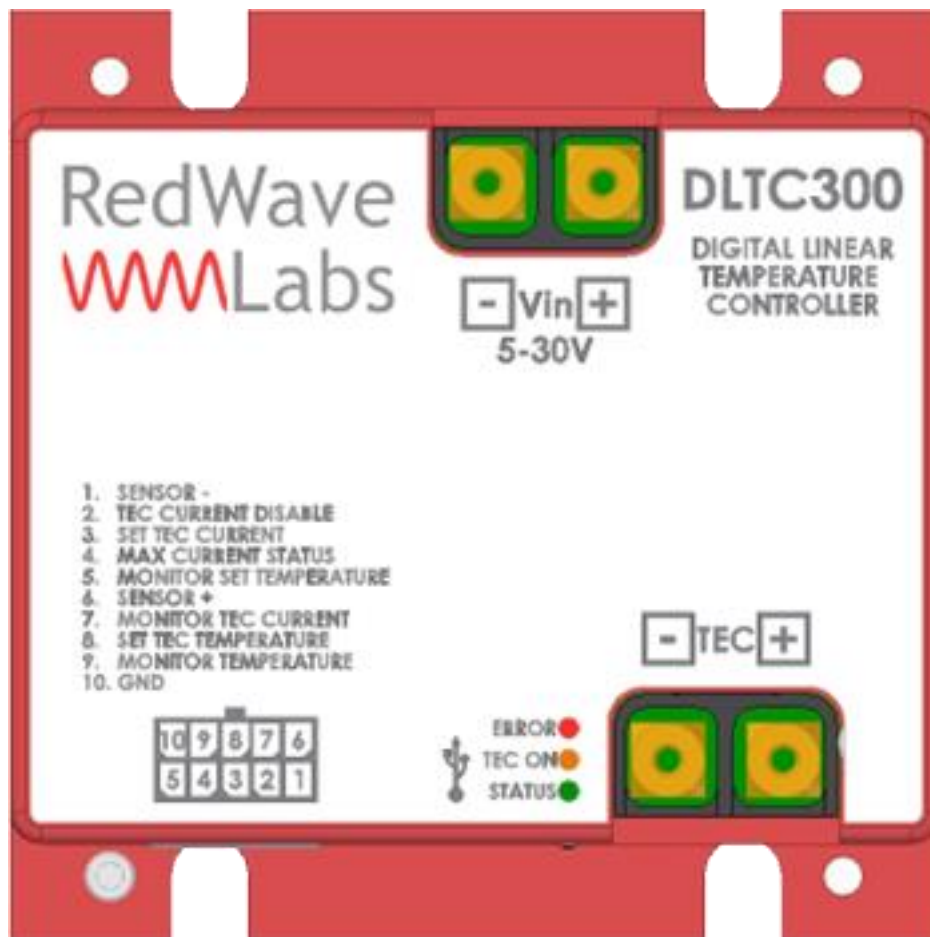
Features	Switched Mode Temperature Control for Thermo-Electric Elements and Resistive Heaters NTC and PTC thermistors as temperature sensors Internal and External PI control Temperature stability 0.001 °C	
Applications	Laser, Detectors, Precision Instrument, OEM application	
Specifications	Parameter	Value
Power	Single	+5 V to 30 V (Vdd)
Input sensor	NTC, PTC thermistor	10, 50, 100, 250, 500, 1000, 1500 $\mu$ A activation current
	Compliance voltage	2 V
Temperature	Internal Set point	Software selected
	External Set point	0-5 V through 14 pin connector or software defined
	Stability Over 1 hour	0.001 °C ( with 20 K thermistor )
Output	Bipolar current	+/-15 A
	Current limit	Symmetrical. User defined between 0 and I <sub>max</sub>
	Compliance voltage	8V typical maximum value
	P-I control	Digital Controlled
	Power	60 W maximum without heatsink
	Security	Software programmable voltage and current limits
Connectors	Power & TEC	Terminal blocks with M3 Screw
	Digital Control	USB B
	Analog Data	14 pin Molex MiniFit (mating part Molex 430251008)
Monitor	Actual temperature	0-5V following sensor voltage
	Set temperature	0-5V requested sensor voltage
	Actual current	0-5V following current with 2.5V offset
	Fault	Active high 5V fault line
Dimensions (WxHxD)	89 x 89 x 23 mm	
Communication	USB 2.0	
Weight	240 g	
Storage Temp	-55 to 100 C	
Operating Temp	-40 to 85 C	

RedWave Labs Ltd keeps improving its products and therefore some specifications can vary.

### Absolute Maximum Ratings

Symbol	Parameter	Ratings	Unit
$V_{dd}$	Supply voltage	+5 to 30	Volt
$T_{op}$	Operational Temperature	-40 to 85	Deg C
$T_{st}$	Storage Temperature	-55 to 100	Deg C

### Mechanical Information



Parameter	Value	Unit
Length	89(3.5)	mm (Inch)
Width	89(3.5)	mm (Inch)
Height	23(0.9)	mm (Inch)
Total Height Including sockets	23(0.9)	mm (Inch)
Weight	240	Gram

## Connections

Power in and Output to TEC are by screw terminals these accept a 3mm screw 5mm long which are supplied. The wire used must be suitable to handle the current required without excessive voltage drop, which could prevent the device from delivering its maximum output current. An isolated supply is recommended for this device if the analog controls are to be used, as no power supply current must flow through the control ground pin as this would cause inaccurate control or readings

The device should be bolted to a heatsink of suitable size to keep the base temperature below 85C

The communication is via a USB “B” style connector which establishes a virtual serial connection, the protocol settings should be left unchanged. This is identified as a USB serial device in windows device manager which will also show the port number allocated to the device.

The analog data port is a 10-way Molex Micro-Fit 3.0

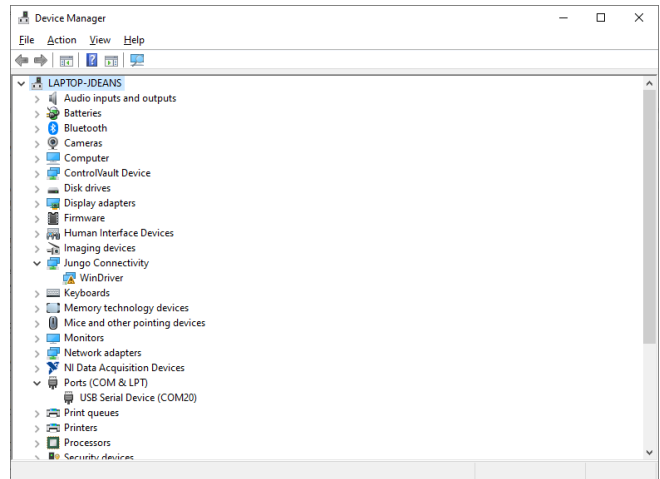
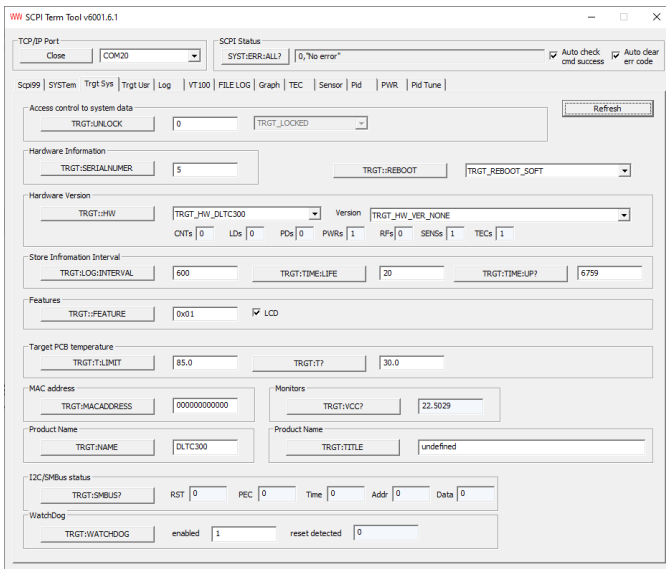
pin				cable core
1	SENSOR -ve	Negative connection for the sensor		2 way Blue
2	TEC CURRENT DISABLE	External TEC current disable Pin,	A logic high disables the TEC power supply	8 way Violet
3	SET TEC CURRENT EXT	Set TEC current In external control mode	The sensitivity is 6A/V with an offset of 2.5V and range of 0V to +5V	8 way Blue
4	MAX CURRENT STATUS	TEC current goes too high or when TEC is open or short circuit	logic high when a fault condition is present	8 way Red
5	MONITOR SET TEMPERATURE	Represents required temperature	Follows the parameters of the selected sensor	8 way Yellow
6	SENSOR +ve	Positive connection for the sensor		2 way Red
7	MONITOR TEC CURRENT	Represents actual TEC Current	The sensitivity is 6A/V with an offset of 2.5V and range of 0V to +5V	8 way Brown
8	SET TEC TEMPERATURE	Demand temperature for TEC in “TEC_MODE_EXT_TEMP_C” mode	Follows the parameters of the selected sensor	8 way Black
9	MONITOR TEMPERATURE	Represents current temperature	Follows the parameters of the selected sensor	8 way White
10	Agnd	Ground for Analogue signals.	This pin must not be connected to the Power Ground (Pin1).	8 way Green

The connector Molex part No. 0430251008 Digi-key part WM16255-ND, Socket contacts Molex Part No.0430300009 Digi-key part WM1839-ND

### Software control

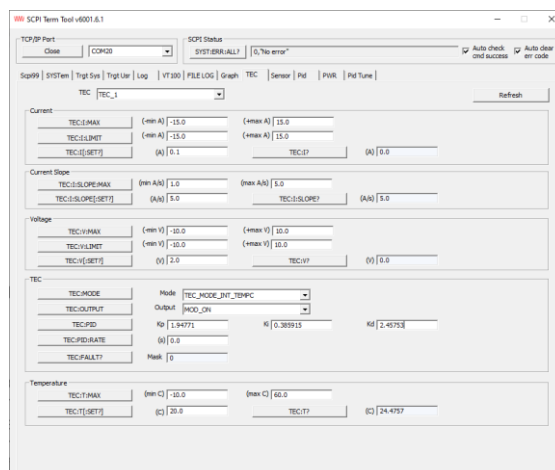
### Connection

The USB port establishes a virtual serial connection the protocol settings must be left unchanged. The Redwave SCPI Term software can be used to set up and manage the device. To connect the device, enter "COMxx" in the TCP/IP port box where xx is the com port number allocated by windows, this can be found in device Manager. Once connected click on the Refresh button in the TrgtSys tab the indicators will load with some basic data from the device



### TEC setup

Click on the TEC Tab followed by refresh in the TEC screen, the default TEC settings will be shown. The maximum current and voltage settings should be set for the TEC being controlled. To adjust settings, enter the value in the text box then click on the adjacent button to load the new value. The required TEC operating mode may be selected



### TEC Mode

TEC mode is elected by the drop-down selection there are four modes

The screenshot shows the 'TEC' control panel. On the left, there are buttons for 'TEC:MODE', 'TEC:OUTPUT', 'TEC:PID', and 'TEC:PID:RATE'. On the right, there is a 'Mode' dropdown menu currently set to 'TEC\_MODE\_INT\_TEMP'. Below it, an 'Output' dropdown menu is open, showing four options: 'TEC\_MODE\_INT\_TEMP' (highlighted), 'TEC\_MODE\_EXT\_TEMP', 'TEC\_MODE\_EXT\_I', and 'TEC\_MODE\_INT\_I'. Further down, there are input fields for 'Kp' (value: 1.9), '(s)' (value: 0.0), and 'Mask' (value: 0).

#### TEC\_MODE\_INT\_TEMP

The TEC is held at the temperature set in the Temperature section, click the TEC:T[SET?] button to set the Temperature entered

The screenshot shows the 'Temperature' control panel. It includes buttons for 'TEC:T:MAX', 'TEC:T[:SET?]', and 'TEC:T?'. There are input fields for '(min C)' (-10.0), '(max C)' (60.0), '(C)' (20.0), and a readout for '(C)' (24.4757).

#### TEC\_MODE\_EXT\_TEMP

The TEC is held at the temperature set by the voltage on the SET TEC TEMPERATURE input pin. The sensor thermistor voltage will be the same that on this pin.

#### TEC\_MODE\_EXT\_I

The TEC current is fixed and set buy the voltage on the SET TEC CURRENT EXT. The sensitivity is 6A/V with an offset of 2.5V and range of 0V to +5V. So 2.5V would signal a current of 0A, 0.5V would be -12A, and 4.5V would be +12A

#### TEC\_MODE\_INT\_I

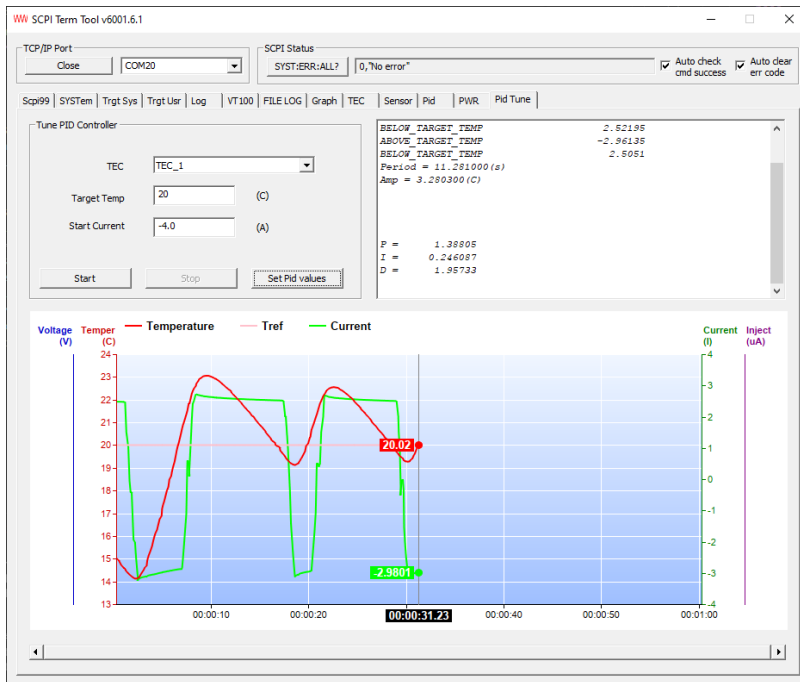
The TEC current is fixed and set by the entry in the TEC:I box in the Current section, click the TEC:I[SET?] button to set the current entered

The screenshot shows the 'Current' control panel. It includes buttons for 'TEC:I:MAX', 'TEC:I:LIMIT', and 'TEC:I[:SET?]', along with a 'TEC:I?' button. There are input fields for '(-min A)' (-15.0), '(+max A)' (15.0), '(-min A)' (-15.0), '(+max A)' (15.0), '(A)' (0.1), and a readout for '(A)' (0.0).

### TEC PID

The screenshot shows the 'TEC' control panel with the 'TEC:PID' button pressed. The 'Mode' dropdown is set to 'TEC\_MODE\_INT\_TEMP' and the 'Output' dropdown is set to 'MOD\_ON'. The PID parameters are displayed: 'Kp' (1.94771), 'Ki' (0.385915), and 'Kd' (2.45753). There are also input fields for '(s)' (0.0) and 'Mask' (0).

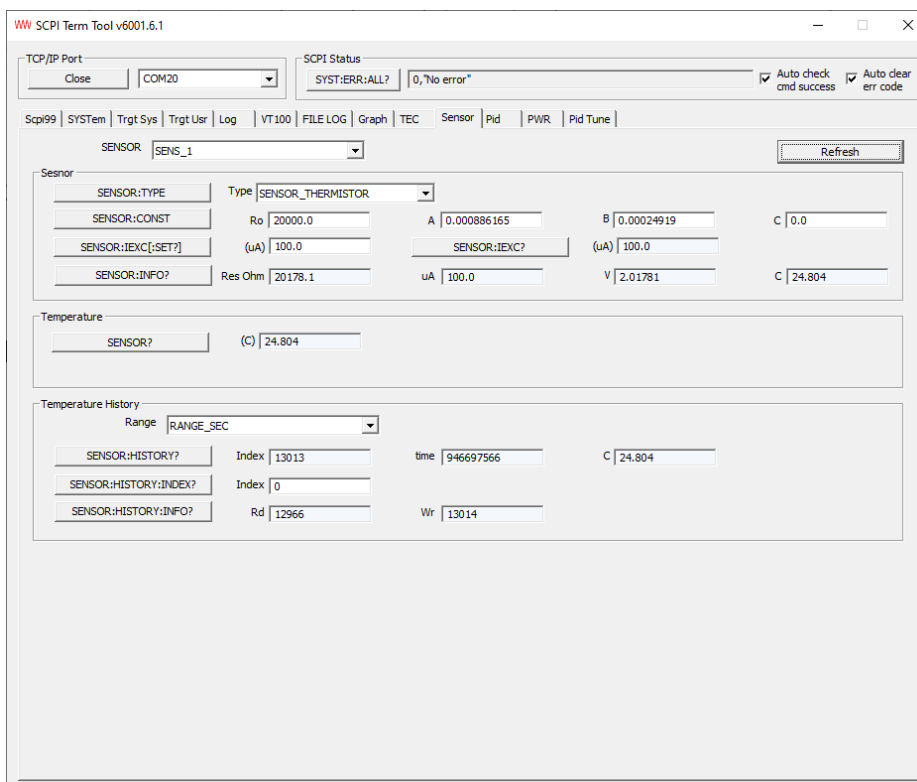
If know the TEC PID parameters may be set in the TEC:PID boxes pressing the TEC:PID button will enter the parameters in to the unit. If the parameters are unknown then the PID tune facility may be used



Set a suitable target temperature click the START button the temperature can be observed cycling twice, in the graph window, the PID information will appear in the output window Click Set Pid Values to set the PID

## Sensor

Click on the Sensor Tab followed by refresh in the sensor screen, the default sensor settings will be shown.





### Sensor:Type

Currently only type SENSOR\_THERMISTOR is supported. Selection of any other type will result in an error

### Sensor:Const

The parameters Ro, A, B, & C from the thermistor data sheet should be entered here

### Sensor:IEXEC[:SET]

The data entered in this box sets the sensor current in uA, values of 10uA, 50uA 100uA 500uA, 1mA or 1.5mA are currently supported, any other values will be adjusted to the lower supported value

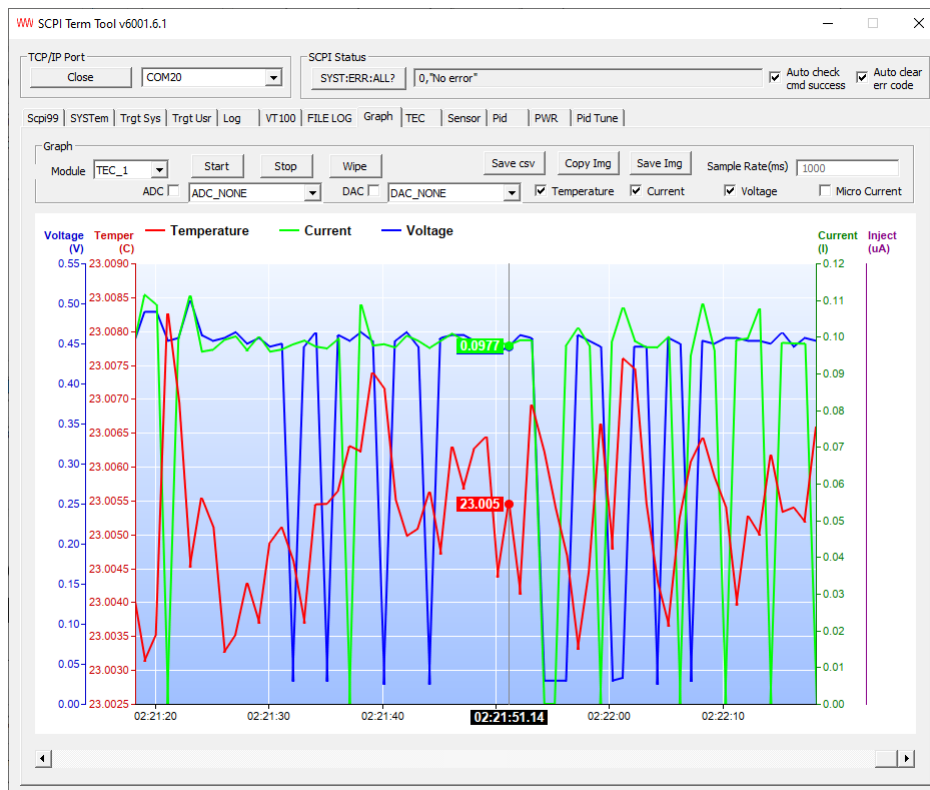
Clicking on the SENSOR:INFO box will show the current sensor conditions

### Sensor selection

Be aware that the maximum sensor voltage is the 3.3V supply rail so a sensor and sensor current must be chosen that will have voltage drop in the range of 0.5 to 3V in the temperature range of interest

## Graph Tab

Clicking on the Graph tag allows graphical monitoring of the TEC temperature



### Certification

RedWave Labs Ltd certifies that: i) the parts and/or materials were produced in conformance with all contractually applicable Government and/or Buyer's specification as referenced in, or furnished with, the above purchase order and ii) all processes required in the production of these parts and/or materials are listed and were performed by a facility or by personnel specifically approved or certified by the seller's cognizant government quality control agency when such approval or certification is required by an applicable specification. RedWave Labs products are not authorized for use in safety-critical applications (such as life support) where a failure of the product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use of the products.

### Warranty and returns

Digital Temperature Controllers are warranted against defects in materials and workmanship for a period of 180 days from date of shipment. During the warranty period RedWave Labs Ltd will replace or repair products which prove to be defective or damaged. Our warranty shall not apply to defects or damages resulting from: i) misuse of the product or ii) operation beyond specifications detailed in the current manual.

### Return procedure

Customer must obtain a valid RMA number by contacting RedWave Labs prior to the return. In all cases the customer is responsible for duty fees incurred on all received shipments and on all international returns for both warranty and non-warranty items; the customer is responsible for any duties, brokers fees or freight charges deemed chargeable to RedWave Labs Ltd.